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# INSTRUCTION MANUAL

FOR

GENERAL ELECTRIC CO.
Instrumentation & Control
228 W. Florence Ave.
Inglewood, Calif. 90301

PRECISION AC-DC VOLTMETER
MODEL AC-110B-1/BR-1

Serial AC-100B-1

Electronic Services - Los Angeles
M14352X

PRECISION Standards CORPORATION

*P.O. BOX 8361 SAN MARINO, CALIF. 91108*

*Precision Instruments for Science and Industry*

PRECISION Standards CORP.
P.O. BOX 8361 SAN MARINO, CALIF.

TVM - ±4% FS
DC - ±0.05%
AC - ± 0.2 %

# PRECISION AC-DC VOLTMETER
## MODEL AC-110B-1/BR-1

Serial AC-100B-1

PRECISION STANDARDS CORPORATION
P. O. BOX 8361, SAN MARINO, CALIF.

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## IMPORTANT

FOR OPTIMUM RESULTS, PLEASE READ THE INSTRUCTION MANUAL CAREFULLY.

This instrument you have purchased represents a major advance in the field of transistorized precision test equipment.

Since this instrument incorporates the latest engineering techniques and design, it is imperative that you become familiar with the proper operating procedure.

Meter zeroing adjustment is performed at the factory. Normally no further adjustment is required. Should adjustment be necessary, the meter may be zeroed by the mechanical adjustment screw on the meter itself while the instrument is operating.

# OPERATING INSTRUCTIONS

## DC MODE

1. The line cord should be plugged into a 117-volt 60-cycle power source. (220-volt if indicated).
2. Turn the null selector to TVM position and power switch on. Let the instrument warm up for approximately 10 minutes.
3. Check mechanical zero of meter. If necessary, adjust to zero by means of the screw in the center of the meter case.
4. Turn the range selector knob to the desired range. Connect the voltage to be measured to the terminal posts. Either positive or negative may be grounded to the common terminal. When operating with the polarity switch in the positive mode, the negative terminal is generally grounded to the case or left floating and in the negative mode, the reverse.
5. The voltage now indicated on the meter is accurate within 4%. If the meter needle swings to the left, turn the polarity switch to the NEG position.
6. Position first two readout dials to the approximate TVM voltage reading. Advance the null selector knob to the 1-volt position. Continue to adjust the readout while increasing the null sensitivity. You are now zeroing in on null.
7. When, by the procedure above, the null selector is at full sensitivity (1 mv) and the meter reading zero, the voltage read from the dials is accurate to better than the rated accuracy of the instrument. Because the sensitivity of your instrument in the 1 mv null position is higher than the stability of many sources, you may not get a reading of zero if the voltage you are measuring is not constant and is fluctuating.

READING EXCURSIONS ABOUT A NOMINAL VOLTAGE

8. To read excursions of voltage about a nominal value, set the readout dials to the nominal value. Excursions may be observed directly on the meter on any of the four null ranges. A right hand deflection of the meter indicates the voltage has increased above the nominal value by the amount indicated on the meter. For voltages read on the 10-volt range and below, use null sensitivity selector as marked. On the 100-volt ranges, the null sensitivity selector value must be multiplied by a factor of 10. On the 1000-volt range the null sensitivity selector value must be multiplied by a factor of 100.

DIRECT MEASUREMENTS OF 10 VOLTS AND ABOVE

9. With the range selector in the 10-volt position, use full scale values as marked on the meter. When range selector is in the 100-volt position, multiply the meter reading by 10. On the 1000-volt range, multiply the reading by 100.

VARIATIONS IN NULL DETECTOR SENSITIVITY

10. Due to the circuit design on the 100-volt range, the null detector will have reduced sensitivity on the 1 mv and 10 mv positions. This is due to a high internal source impedance of the high voltage input divider. The sensitivity is about 50% less in the 1 mv null position and about 15% less on the 10 mv position. Only a very slight loss of sensitivity is noticed on the other null ranges. When the range selector is in the 1000-volt position, a 10% loss of sensitivity will be noticed in the 1 mv position.

The other null ranges will have only a very slight loss of sensitivity.

MEASUREMENTS BELOW 1 VOLT IN DIFFERENTIAL MODE

11. When making measurements below 1 volt, turn Range Selector switch to the 1-volt position. Set null selector to the 1 mv position. Set all readout dials to zero and short positive and negative input terminals together.

12. Now set the mechanical meter adjustment to zero. This will cancel out error due to zero offset between the 1 millivolt range and the VTVM range. Remove short across terminals and proceed with the reading of voltage per paragraphs 4, 5, 6, and 7.

"POS" AND "NEG" POLARITY

13. This instrument is capable of measuring both positive and negative voltages without reversing the input connections, by setting the polarity switch in the correct position.

Under some conditions the reading in the "NEG" position may differ from the "POS" position. This difference is very small in comparison to the rated accuracy of the instrument. Since the instrument is calibrated in the "POS" position, the best accuracy will result when the polarity switch is in this position.

RECORDER OUTPUT

14. Two sets of output terminals are located on the rear of the voltmeter. One set is the recorder output and the other is the Kelvin-Varley output. The output voltage of the recorder output terminals is ±25 mv for a full scale deflection. The output impedance is approximately 200Ω. Any recorder may be used so long as the leakage resistance to the line or ground is better than 10,000 megohms.

When using high speed recorders, it may be necessary to install a filter between the output terminals of the voltmeter and the input of the recorder. The output signal of the voltmeter will have the demodulated chopper signal and must be filtered out. Generally a three-stage RC filter using 33K resistors and 1 mfd capacitors will be sufficient.

KELVIN-VARLEY OUTPUT

15. The second set of terminals provide an output from the Kelvin-Varley Divider. The maximum output is 10 vdc when the instrument range selector is in the 10-volt position. A chart showing the output impedance of the KVD is located in the back of this manual.

## AC MODE

16. Follow instructions under DC MODE, paragraphs 1, 2, and 3.

17. For best results, connect the ground terminal to the negative terminal. However, in most applications the input may be left floating.

18. Polarity switch must be set to AC.

19. Turn the range selector knob to the desired range. Connect the voltage to be measured to the input terminal posts. The voltage now indicated on the meter is accurate within 4%.

20. Position the first two readout dials to the approximate TVM voltage reading. Advance the null selector knob to the 1-volt position. Continue to adjust the readout while increasing the null sensitivity. You are now zeroing in on the null.

21. When, by the procedure above, the null selector is at full sensitivity and the meter reading zero, the voltage read from the dials is accurate to better than the rated accuracy of the instrument. Because the sensitivity of your instrument in its most sensitive position is higher than the stability of many sources, you may not get a reading of zero if the voltage you are measuring is not constant and is fluctuating.

READING EXCURSIONS ABOUT A NOMINAL VOLTAGE

22. To read excursions of voltage about a nominal value. set the readout dials to the nominal value. Excursions may be observed directly on the meter on any of the four null ranges. A right hand deflection of the meter indicates the voltage has increased above the nominal value by the amount indicated on the meter. For voltages read on the 10-volt range, use null sensitivity selector as marked. On the 100-volt ranges, the null sensitivity selector value must be multiplied by a factor of 10. On the 1000-volt range the null sensitivity selector value must be multiplied by a factor of 100.

DIRECT MEASUREMENTS OF 10 VOLTS AND ABOVE

23. With the range selector in the 10-volt position, use full scale values as marked on the meter. When range selector is in the 100-volt position, multiply the meter reading by 10. On the 1000-volt range, multiply the reading by 100.

VARIATIONS IN NULL DETECTOR SENSITIVITY

24. Due to the circuit design on the 100-volt range, the null detector will have reduced sensitivity on the 1 mv and 10 mv positions. This is due to a high internal source impedance of the high voltage input divider. The sensitivity is about 50% less in the 1 mv null position and about 15% less on the 10 mv position. Only a very slight loss of sensitivity is noticed on the other null ranges. When the range selector is in the 1000-volt position, a 10% loss of sensitivity will be noticed in the 1 mv position.

# CIRCUIT DESCRIPTION

## DC SECTION

This Honeywell Inc. Voltmeter is designed for long, trouble-free life. There are no batteries or components that would normally need replacing.

This dependable voltmeter operates on the principle of comparing an unknown voltage with an adjustable known voltage. A sensitive null detector is used to provide a means of sensing when the known and unknown voltages are equal.

The DC section of the voltmeter is composed of three basic elements:

(1) An ultra stable reference supply.

(2) An accurate Kelvin-Varley divider.

(3) A sensitive null detector.

# CALIBRATION

## DC

A suggested setup for calibrating the instrument is included in this manual.

A. CALIBRATION OF THE DIFFERENTIAL SECTION

The "RANGE SELECTOR" - "10V" range is calibrated first. On this range the instrument has an infinite input resistance at null.

1. Check mechanical zero of meter. If necessary, adjust to zero by means of the screw in the center of the meter case.
2. Next, turn "NULL SELECTOR" to the TVM position and power switch on. Check electrical zero of meter. If necessary, adjust to zero by means of R31.
3. Apply a known 10-volt calibration voltage across the "POS" and "NEG" input terminals. The instrument meter should read full scale. Turn "READOUT" dials to read (9). (9) (9) (9) (9) (10) and turn "NULL SELECTOR" switch to the "1 MV" position. Bring meter to zero by adjusting the appropriate calibration trim potentiometer. (See calibration board component layout.)
4. Repeat the basic procedure for calibration of the "1V" range using a known 1 volt. Repeat the basic procedure for calibration of the "100 mv" range using a known 100 mv source. (Omit where not applicable.)
5. The "RANGE SELECTOR" - "100V" and "1000V" ranges are calibrated next. On these ranges the instrument has a 2 megohm input resistance.
6. Turn the "RANGE SELECTOR" switch to the "100V" position and apply a known 100-volt calibration voltage at meter input. Continue basic calibration procedure outlined in paragraph 3.

   NOTE: Multiply "NULL SELECTOR" ranges by 10.
7. Turn the "RANGE SELECTOR" switch to the "1000V" position. Apply a known 1000 volts with the "READOUT" dials turned to (9) (9) (9) (9) (9) (10). Bring meter to zero by adjusting the appropriate trim potentiometer.

B. CALIBRATION OF THE TVM RANGES

Calibrate the TVM Ranges by setting the "RANGE SELECTOR" switch to the "10V" position and apply a known 10-volt calibration voltage. Adjust potentiometer R32 for full-scale deflection. It is not necessary to calibrate the remaining TVM ranges.

## 3. CALIBRATION, AC

### 3.1 Equipment Required:

3.1.1 Stable, low distortion AC source. Capable of providing 1000, 100, 10, and 1.0 VAC at 400 cycles, 5 kilocycles, and 10 kilocycles. Voltage stability and accuracy better than .03%. Hold Model 323A or equivalent.

3.1.2 Transfer Standard. Sensitive Research Model FLH with Galvanometer, or equivalent.

3.1.3 DC Power Source. 0-1000 vdc short-term stability, better than .005%. CSC Model VS-100BR, or equivalent.

3.1.4 DC Differential Voltmeter. Accuracy better than .01% from 0 to 1000 volts. CSC Model DC-110B, or equivalent.

### 3.2 Equipment Set-Up:

3.2.1 Connect equipment as shown in diagram.

3.2.2 The Transfer Standard and DC Power Source may be omitted providing AC source is within the specifications of 3.1.1.

### 3.3 Procedure:

3.3.1 Refer to manual page showing component and adjustment locations.

3.3.2 Perform DC calibration before proceding with AC.

3.3.3 Set range switch to 10 volt position.

3.3.4 Set AC source to 10 volts 400 cycles.

3.3.5 Set R113 to approximately mid range.

3.3.6 Adjust R99, advancing null sensitivity, until meter is at null.

3.3.7 If null cannot be obtained within range of R99, reset R113 and repeat 3.3.6.

3.3.8 Set AC source to 10 volts 10 kc.

3.3.9 Adjust C26, advancing null sensitivity, until meter is at null.

3.3.10 Set range switch to 1 volt position.

3.3.11 Set AC source to 1.0 volts 400 cycles.

3. CALIBRATION, AC (Continued)

3.3.12 Adjust R95 until meter is at null. (Note that null sensitivity increases by a factor of 10X, 10 mv null range should be used).

3.3.13 Set AC source to 1.0 volts 10 kc.

3.3.14 Adjust C43 until meter is at null.

3.3.15 Set range switch to 100 volt position.

3.3.16 Set AC source to 100 volts 400 cycles.

3.3.17 Adjust R77 until meter is at null.

3.3.18 Set AC source to 100 volts 10 kc.

3.3.19 Adjust C35 until meter is at null.

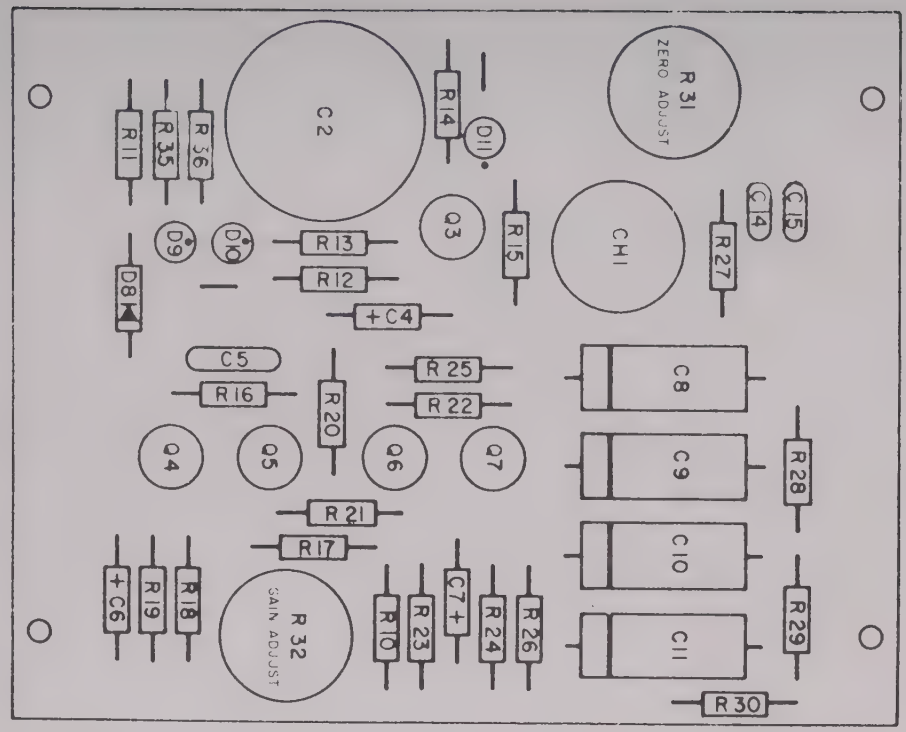
3.3.20 Set range switch to 1000 volt position.

3.3.21 Set AC source to 1000 volts 400 cycles.

3.3.22 Adjust R78 until meter is at null.

3.3.23 Set AC source to 1000 volts 10 kc.

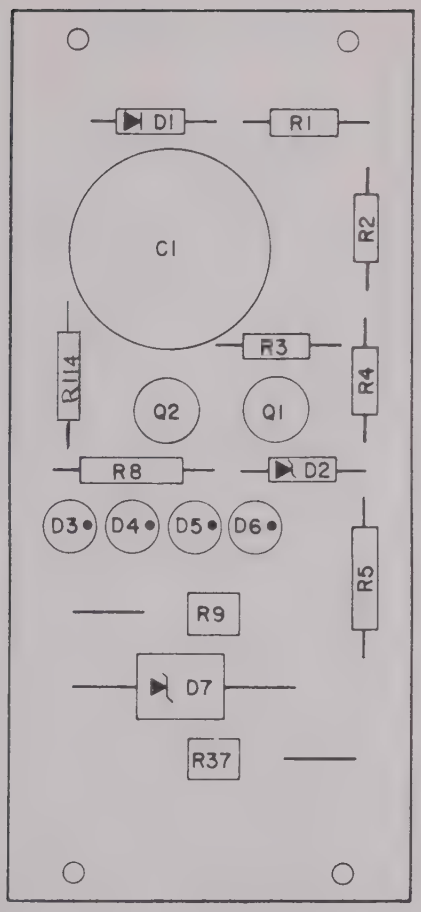
3.3.24 Adjust C36 until meter is at null.




# COMPONENT LOCATION AMPLIFIER

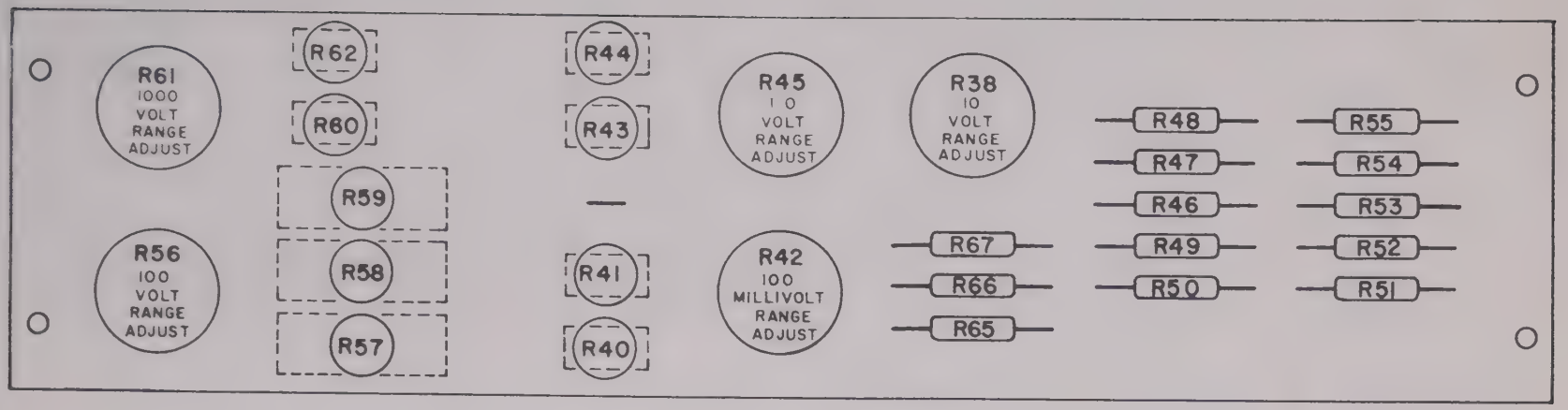
301-100

(REVISION A)



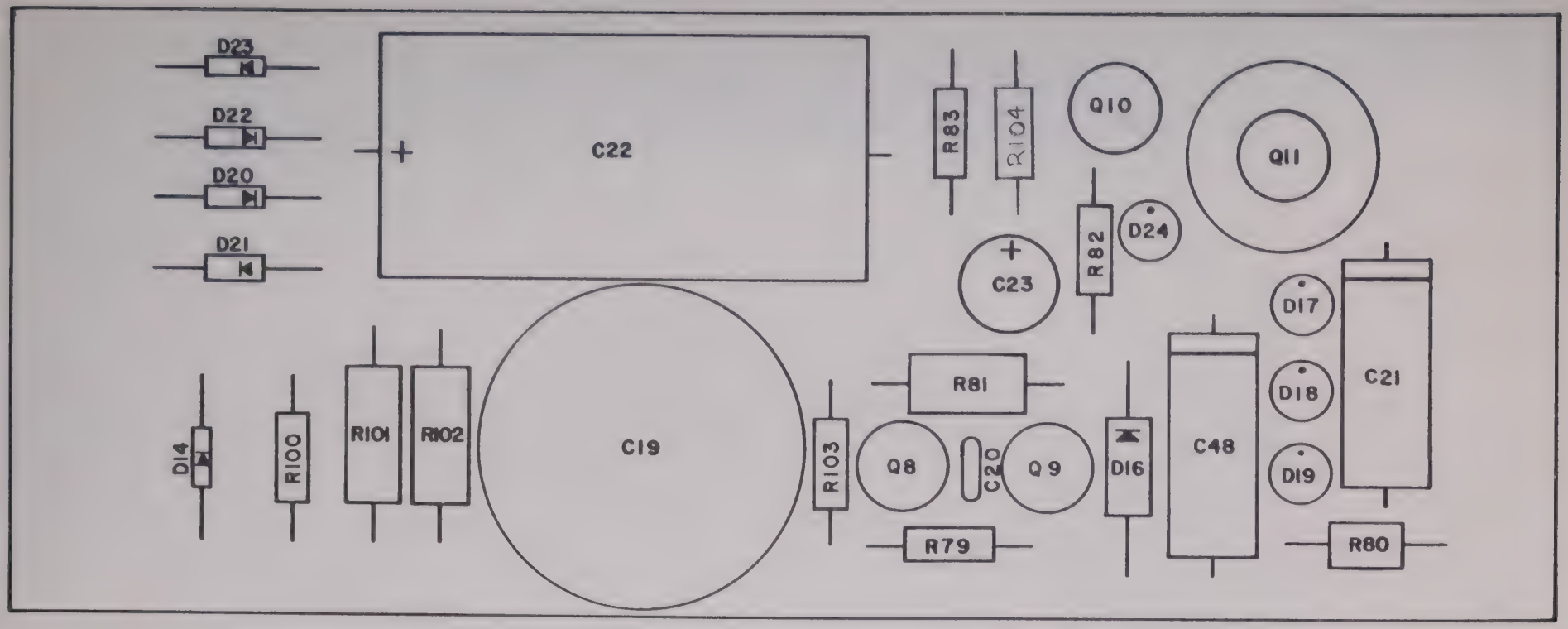

# COMPONENT LOCATION REFERENCE

302-110



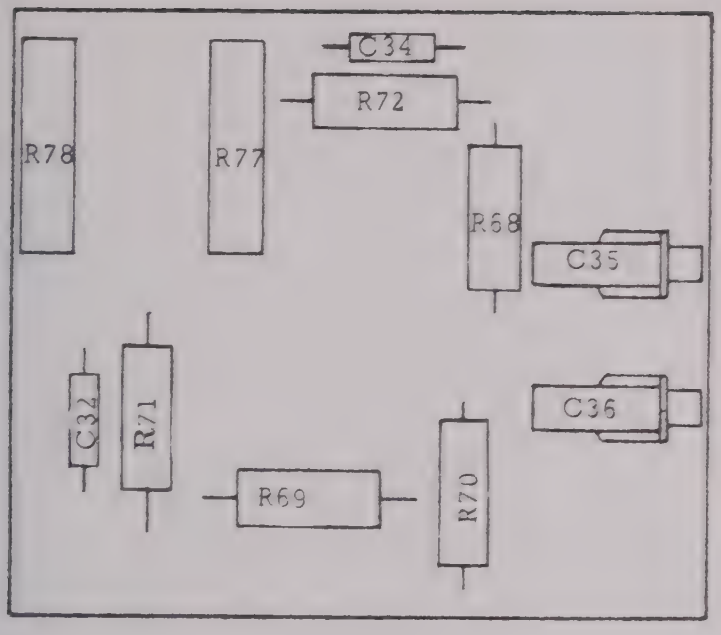

# COMPONENT LOCATION CALIBRATION

301-102




# COMPONENT LOCATION POWER SUPPLY

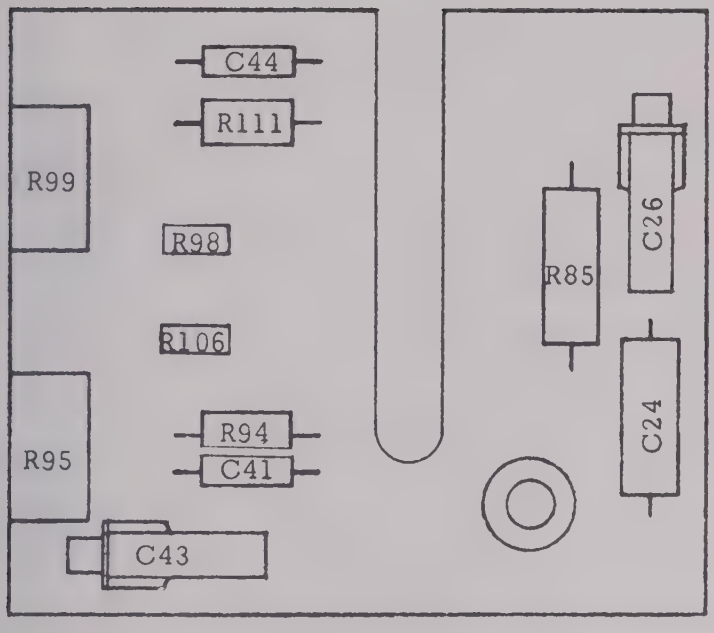
301-103




COMPONENT LOCATION

AC HIGH VOLTAGE DIVIDER

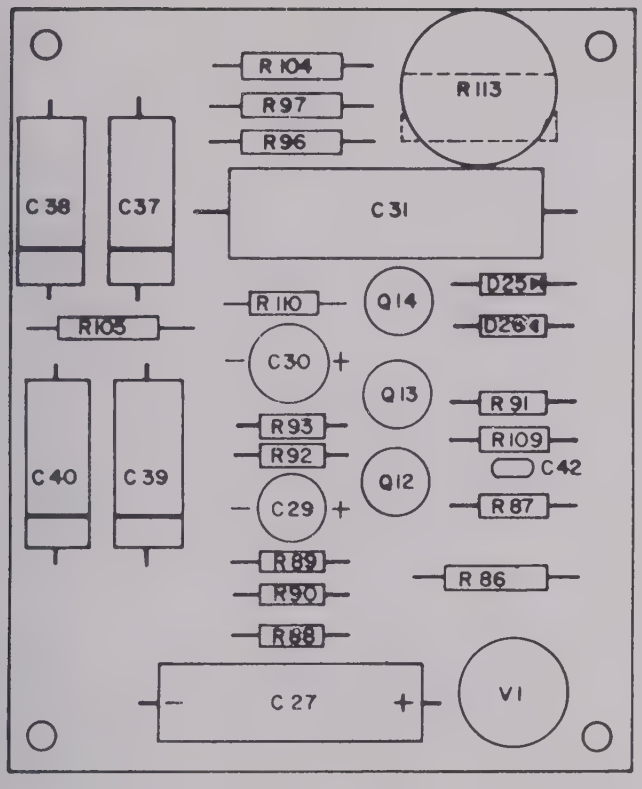
301-104




**COMPONENT LOCATION**

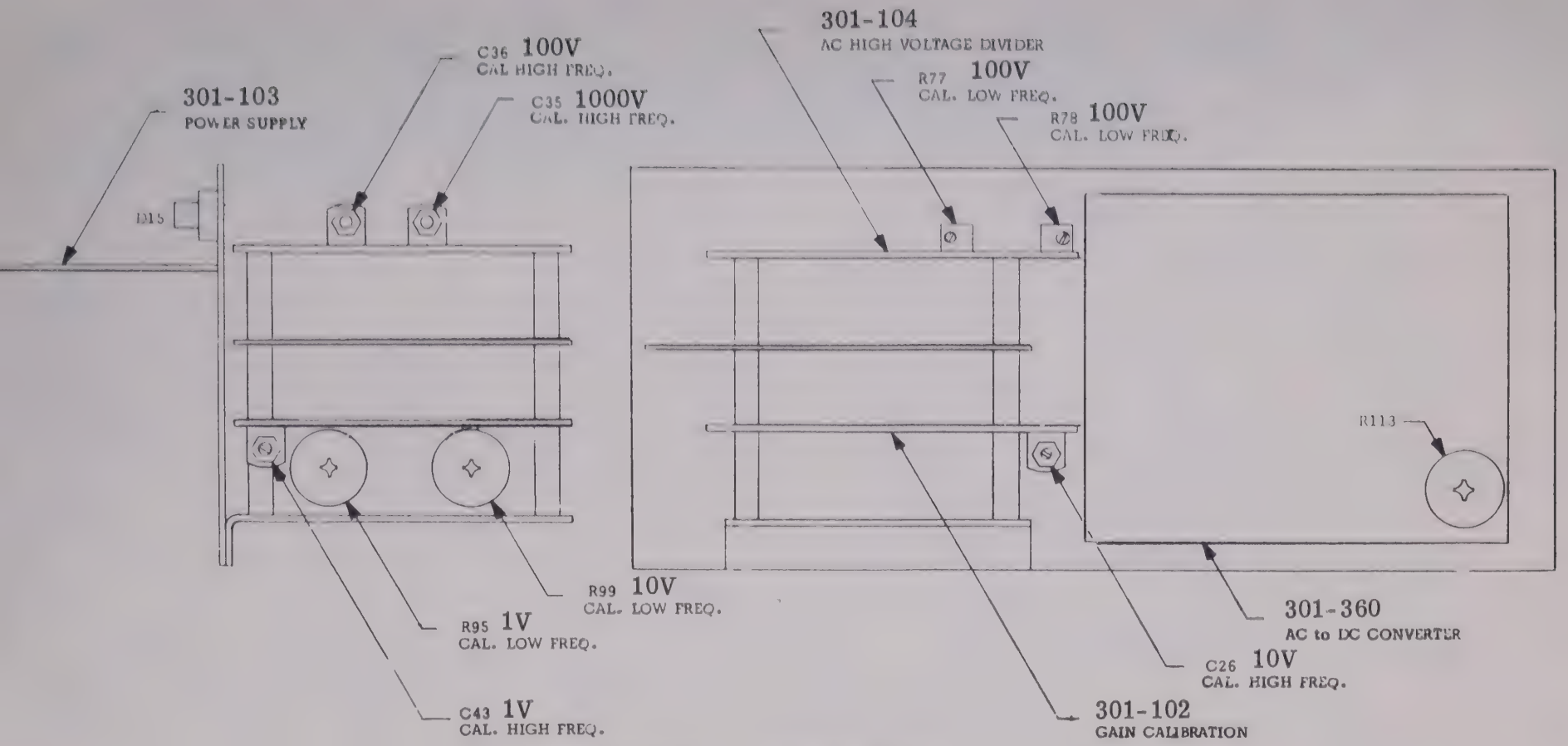
**GAIN CALIBRATION**

301-105

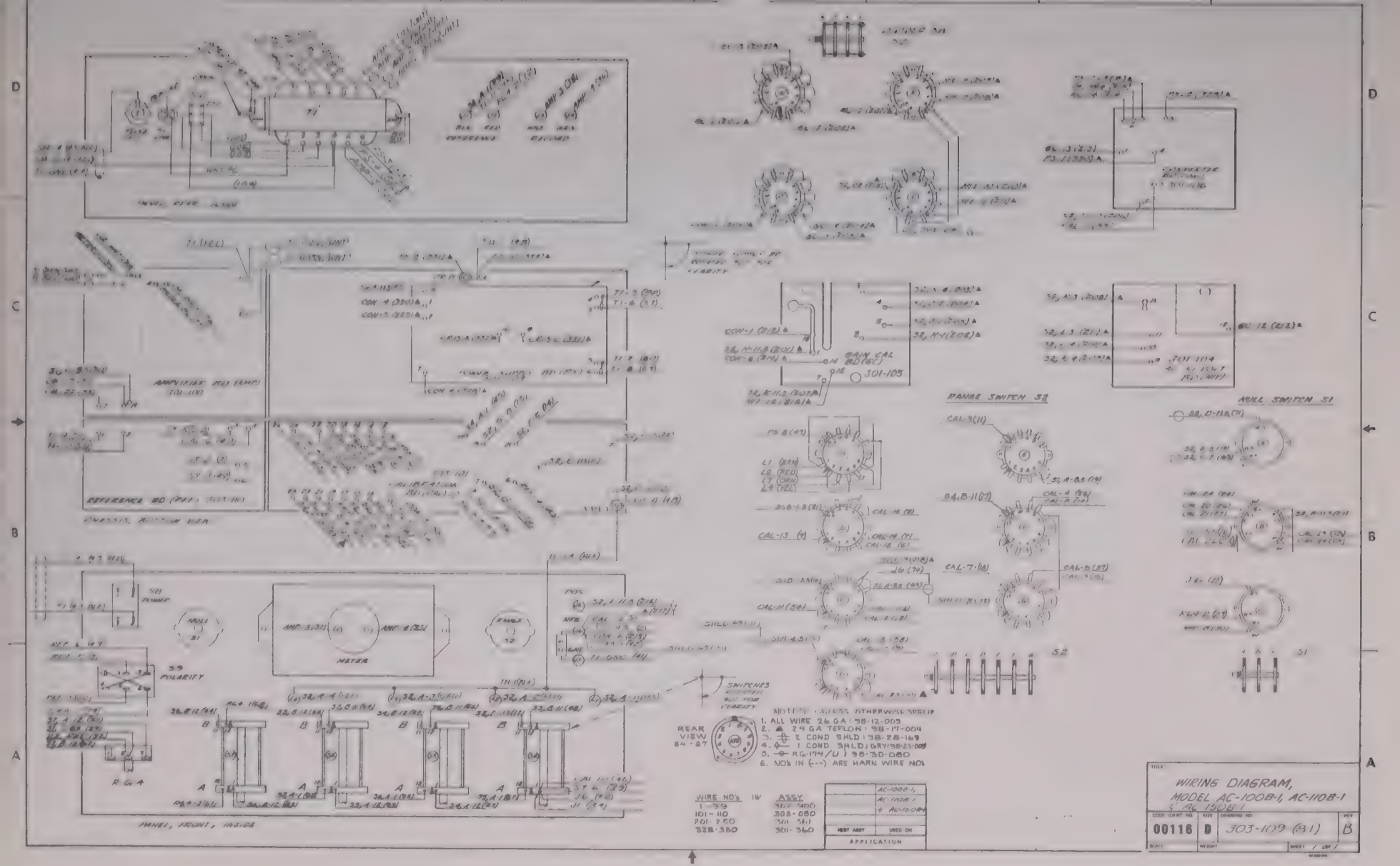


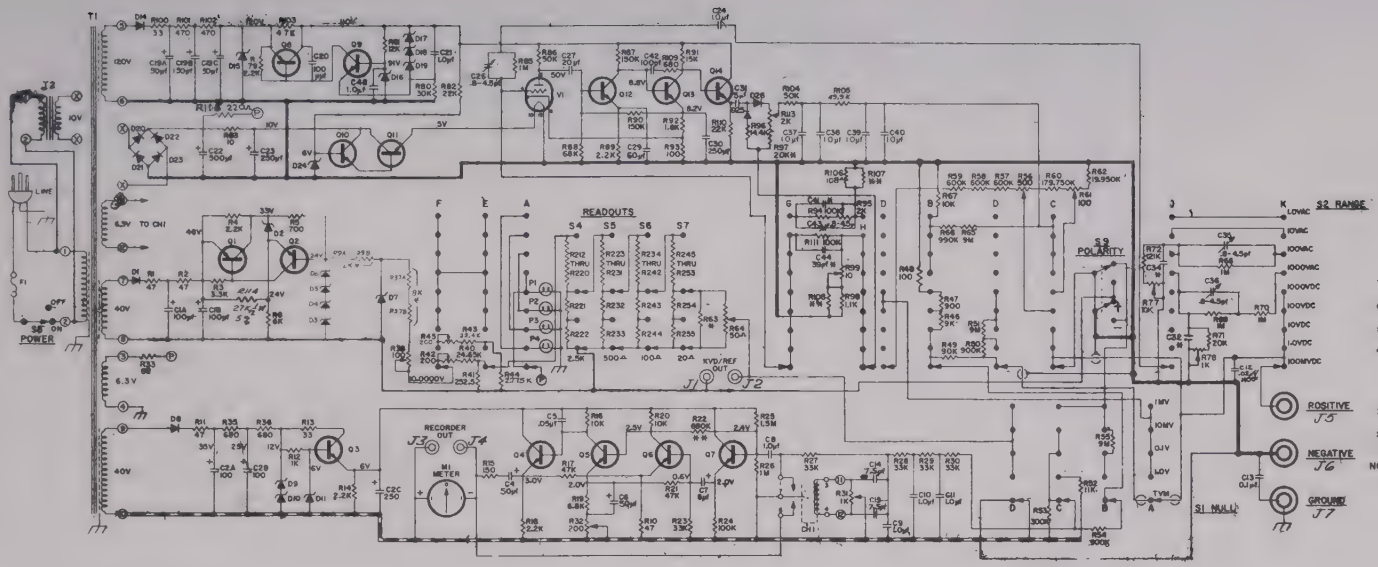

# COMPONENT LOCATION AC TO DC CONVERTER

301-106




COMPONENT AND ADJUSTMENT LOCATION


RANGE SWITCH S2
PANEL SWITCH S1
REAR VIEW S4 - S7
SWITCHES
MOTOR
AMPLIFIER ASSY (AMP) TOR 1100
REFERENCE BD (REF) 303-110
CHASSIS, ALUMINUM
PANEL, FRONT, INSIDE
GAIN CAL BD (GC) 301-105
301-104
S1
S2
S3
S4
S5
S6
S7
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL WIRE 26 GA / 98-12-009
2. ▲ 24 GA TEFLON / 98-17-004
3. ⊕ 2 COND SHLD / 98-28-169
4. ⊕ 1 COND SHLD GRY / 98-25-009
5. ⊕ RG-179/U / 98-30-080
6. NOS IN (---) ARE HARN WIRE NOS
WIRE NO'S
1 - 99
101 - 110
201 - 250
328 - 380
ASSY
302 - 900
303 - 050
301 - 361
301 - 360
AC-1008-1
AC-1108-1
# AC-1008-1
NEXT ASSY
USED ON
APPLICATION
WIRING DIAGRAM, MODEL AC-1008-1, AC-1108-1
CODE IDENT NO. 00116
SIZE D
DRAWING NO. 303-109 (B1)
REV B
SCALE
WEIGHT
SHEET 1 OF 1




1. DIODES (D25 & D26) 1N916

NOTE:

| | |
|---|---|
| | |
| | |
| | |
| | |
| NEXT ASSY | USED ON |
| APPLICATION | |

| | | | |
|---|---|---|---|
| TITLE: SCHEMATIC MODEL AC 110B / BR-1 | | | |
| CODE IDENT. NO. 00116 | SIZE D | DRAWING NO. 302-100-(86) | REV. M |
| SCALE | WEIGHT | SHEET | |

# MODEL AC-100B-1/BR
# MODEL AC-110B-1/BR
# PRECISION AC-DC VOLTMETER
# PARTS LIST

| Reference or Symbol Designator | Nomenclature | Stock No. | Qty. Per Ass'y. |
|---|---|---|---|
| | *Instrument Cover Assy | 301-443-80 | 1 |
| | Instrument Cover | 301-443-30 | 1 |
| | Handle | 74-29-219 | 1 |
| | Support, Cover | 302-300-30 | 1 |
| | *Bottom Cover Assy | 301-444-80 | 1 |
| | Bottom Cover | 301-444-30 | 1 |
| | Rubber Feet | 90-22-030 | 4 |
| | *NOTE: Applies to "B" Series only | | |
| | Chassis | 301-302-30 | 1 |
| | Support | 301-305-31 | 1 |
| | Back Panel | 301-317-30 | 1 |
| | Panel Spacer | 74-74-041 | 4 |
| | Fuseholder | 72-05-052 | 1 |
| F1 | Fuse, $\frac{1}{4}$ amp Slo-Blo | 72-02-015 | 1 |
| | Jack, white | 70-31-030 | 1 |
| | Jack, red | 70-31-031 | 1 |
| | Jack, black | 70-31-032 | 1 |
| | Jack, green | 70-31-033 | 1 |
| T1 | Transformer | 96-16-026 | 1 |
| | Line Cord Bracket | 301-445-30 | 1 |
| | Line Cord | 98-28-103 | 1 |
| | Strain Relief | 74-11-075 | 1 |
| R64 | Potentiometer 50 ohm | 88-15-091 | 1 |
| | Input Cable, red | 98-28-120 | 1 |
| | Input Cable, black | 98-28-121 | 1 |
| | Knob | 77-02-035 | 5 |
| | Knob | 77-02-026 | 2 |
| | Skirt, KVD (0-9) | 301-436-30 | 4 |
| | Skirt, Pot. (0-10) | 301-438-30 | 1 |
| | Flexible Coupling | 74-40-005 | 1 |

| Reference or Symbol Designator | Nomenclature | Stock No. | Qty. Per Ass'y. |
|---|---|---|---|
| | Front Panel Assy | 302-351-81 | 1 |
| | Binding Post, red | 73-08-014 | 1 |
| | Binding Post, black | 73-08-013 | 2 |
| | Decimal Light Assy #1 | 301-356-80 | 1 |
| | Decimal Light Assy #2 | 301-358-80 | 1 |
| | Decimal Light Assy #3 | 301-359-80 | 1 |
| | Decimal Light Assy #4 | 301-367-80 | 1 |
| | Tru-Arc | 74-69-046 | 4 |
| | "O" Ring | 90-28-327 | 4 |
| M1 | Meter | 99-12-058 | 1 |
| | Capacitor: | | |
| C12 | Ceramic .02μf 1000V | 48-10-205 | 1 |
| C13 | Ceramic .1μf 1000V | 45-04-104 | 1 |
| | Resistor: | | |
| R33 | Comp. 68 ohm ½W 5% | 86-05-248 | 1 |
| | Switches: | | |
| S1 | Switch, Rotary (NULL) | 95-70-032 | 1 |
| S2 | Switch, Rotary (RANGE) | 95-71-010 | 1 |
| S8 | Switch, Toggle SPST (POWER) | 95-79-026 | 1 |
| S9 | Switch, Toggle DPDT (POLARITY) | 95-79-011 | 1 |
| | Front Panel | 302-356-30 | 1 |
| | KVD Switch Set Assy | 301-350-81 | 1 |
| S4, S5, S6 | Switch, Rotary | 95-80-256 | 3 |
| R212 thru R222 | Resistor Set, Matched WW 2.5K .0025% | 14-17-400 | 1 |
| R223 thru R233 | Resistor Set, Matched WW 500 ohm ½W .01% | 14-17-250 | 1 |
| R234 thru R244 | Resistor Set, Matched WW 100 ohm ½W .05% | 14-14-102 | 1 |
| | KVD Switch Assy, 20 ohm | 301-355-80 | 1 |
| S7 | Switch, Rotary | 95-80-256 | 1 |
| | Resistor: | | |
| R245 thru R255 | WW 20 ohm ½W 5% | 14-15-020 | 11 |

| Reference or Symbol Designator | Nomenclature | Stock No. | Qty. Per Ass'y. |
|---|---|---|---|
| | Calibration Board Assembly | 301-102-81 | 1 |
| | Resistors: | | |
| R65 | Metal film 9 meg $\frac{1}{2}$W 1% | 85-11-988 | 1 |
| R66 | Metal film 990K $\frac{1}{2}$W 1% | 85-11-959 | 1 |
| R67 | Metal film 10K $\frac{1}{2}$W 1% | 85-11-589 | 1 |
| | Calibration Board Sub Assembly | 301-102-61 | 1 |
| | Potentiometers: | | |
| R38, R61 | Potentiometer 100 ohm | 88-15-099 | 2 |
| R42, R45 | Potentiometer 200 ohm | 88-15-110 | 2 |
| R56 | Potentiometer 500 ohm | 88-15-208 | 1 |
| | Resistors: | | |
| R40 | WW 24.65K 1/3W .05% | 15-05-095 | 1 |
| R41 | WW 252.52 ohm 1/3W .05% | 15-05-075 | 1 |
| R43 | WW 22.4K 1/3W .05% | 15-05-094 | 1 |
| R44 | WW 2775 ohm 1/3W .05% | 15-05-090 | 1 |
| R46 | Metal film 9K $\frac{1}{2}$W 1% | 85-11-580 | 1 |
| R47 | Metal film 900 ohm $\frac{1}{2}$W 1% | 85-11-376 | 1 |
| R48 | Metal film 100 ohm $\frac{1}{2}$W 1% | 85-11-194 | 1 |
| R49 | Metal film 90K $\frac{1}{2}$W 1% | 85-11-770 | 1 |
| R50, R54 | Metal film 900K $\frac{1}{2}$W 1% | 85-11-953 | 2 |
| R51, R55 | Metal film 9 meg $\frac{1}{2}$W 1% | 85-11-988 | 2 |
| R52 | Metal film 11K $\frac{1}{2}$W 1% | 85-11-600 | 1 |
| R53 | Metal film 300K $\frac{1}{2}$W 1% | 85-11-870 | 1 |
| R57, R58, R59 | WW 600K 1/3W .05% | 15-05-600 | 3 |
| R60 | WW 179.75K 1/3W .05% | 15-05-180 | 1 |

| Reference or Symbol Designator | Nomenclature | Stock No. | Qty. Per Ass'y. |
|---|---|---|---|
| | Reference Board Assy | 302-110-80 | 1 |
| | Capacitor: | | |
| C1A, C1B | Dual Electrolytic 100μf-100μf 50V | 61-62-121 | 1 |
| | Diodes: | | |
| D1 | Diode Special | 94-02-600 | 1 |
| D2 | Diode Zener | 94-16-047 | 1 |
| D3, D4 | Diode, Zener | 94-16-055 | 2 |
| D5, D6 | Diode, Zener | 94-06-050 | 2 |
| D7 | Diode, Zener | 94-45-537 | 1 |
| | Transistor: | | |
| Q1 | 2N3391 | 91-33-910 | 1 |
| Q2 | Transistor Special (507) | 94-58-507 | 1 |
| | Resistor: | | |
| R1, R2 | Comp. 47 ohm $\frac{1}{2}$W 5% | 86-05-232 | 2 |
| R3 | Comp. 3.3K $\frac{1}{2}$W 5% | 86-05-416 | 1 |
| R4 | Comp. 2.2K $\frac{1}{2}$W 5% | 86-05-396 | 1 |
| R5 | Metal Film 700 ohm $\frac{1}{2}$W 1% | 85-11-350 | 1 |
| R8 | Metal Film 6K $\frac{1}{2}$W 1% | 85-11-560 | 1 |
| R114 | Comp. 27K $\frac{1}{2}$W 5% | 86-05-508 | 1 |
| R9, R37, R39 | Value selected at factory | | |

| Reference or Symbol Designator | Nomenclature | Stock No. | Qty. Per Ass'y. |
|---|---|---|---|
| | Amplifier Board Assy | 301-100-83 | 1 |
| | Socket, 7 pin | 73-75-115 | 1 |
| | Tube Shield | 74-72-002 | 1 |
| CH1 | Chopper | 67-01-193 | 1 |
| | Capacitor: | | |
| C2A, C2B, C2C | Electrolytic 100-100-250μf 50V | 61-62-910 | 1 |
| C4, C6 | Tantalum 60μf 6V | 64-21-606 | 2 |
| C5 | Ceramic .05μf 75V | 48-10-503 | 1 |
| C7 | Tantalum 8μf 20V | 64-31-825 | 1 |
| C8 | Capacitor Assy 1μf 200V | 301-459-80 | 1 |
| C9 thru C11 | Met. Paper 1μf 200V | 56-02-017 | 3 |
| C14, C15 | Ceramic 7.5μμf 1000V | 48-10-750 | 2 |
| | Diode: | | |
| D8 | Diode Special | 94-02-600 | 1 |
| D9, D10, D11 | Diode Zener | 94-16-055 | 3 |
| | Transistor: | | |
| Q3 | Transistor Special | 94-53-103 | 1 |
| Q4, Q5, Q7 | Transistor Special | 94-53-660 | 3 |
| Q6 | Transistor Special | 94-53-099 | 1 |
| | Potentiometer: | | |
| R31 | Potentiometer 1K | 88-15-256 | 1 |
| R32 | Potentiometer 200 ohm | 88-15-110 | 1 |
| | Resistor: | | |
| R10, R11 | Comp. 47 ohm ½W 5% | 86-05-232 | 2 |
| R12 | Comp. 1K ½W 5% | 86-05-364 | 1 |
| R13 | Comp. 33 ohm ½W 5% | 86-05-216 | 1 |
| R14, R18 | Comp. 2.2K ½W 5% | 86-05-396 | 2 |
| R15 | Comp. 150 ohm ½W 5% | 86-05-280 | 1 |
| R16, R20 | Comp. 10K ½W 5% | 86-05-464 | 2 |
| R17, R21 | Comp. 47K ½W 5% | 86-05-532 | 2 |
| R19 | Comp. 6.8K ½W 5% | 86-05-448 | 1 |
| R22 | Comp. 680K ½W 5% | 86-05-648 | 1 |
| R23, R27 thru R30 | Comp. 33K ½W 5% | 86-05-516 | 5 |
| R24 | Comp. 100K ½W 5% | 86-05-564 | 1 |
| R25 | Comp. 1.5 meg ½W 5% | 86-05-680 | 1 |
| R26 | Comp. 1 meg ½W 5% | 86-05-664 | 1 |
| R35, R36 | Comp. 680 ohm ½W 5% | 86-05-348 | 2 |

| Reference or Symbol Designator | Nomenclature | Stock No. | Qty. Per Ass'y. |
|---|---|---|---|
| | Converter Assembly | 301-360-81 | 1 |
| | Chassis Plate | 301-307-30 | 1 |
| | Mounting Bracket | 74-08-102 | 2 |
| | Grommet | 90-28-024 | 1 |
| | Spacer | 74-74-011 | 4 |
| | Diode: | | |
| D15 | 1N3008B | 92-30-085 | 1 |

| Reference or Symbol Designator | Nomenclature | Stock No. | Qty. Per Ass'y. |
|---|---|---|---|
| | Converter Board Assy | 301-106-83 | 1 |
| | Switch, Adapter | 95-80-603 | 1 |
| | Socket, Printed Circuit | 73-75-256 | 1 |
| | Vacuum Tube: | | |
| V1 | 6CW4 (Nuvistor) | 97-02-125 | 1 |
| | Capacitors: | | |
| C27 | Electrolytic 20μf 100V | 61-06-206 | 1 |
| C29 | Tantalum 60μf 6V | 64-21-606 | 1 |
| C30 | Tantalum 250μf 10V | 64-13-257 | 1 |
| C31 | Met. Mylar 5μf 200V | 55-02-056 | 1 |
| C37 thru C40 | Met. Paper 1.0μf 200V | 56-02-017 | 4 |
| C42 | Ceramic 100μμf 1000V | 48-10-101 | 1 |
| | Diode: | | |
| D25, D26 | 1N916 | 92-09-160 | 2 |
| | Transistor: | | |
| Q12 | 2N3566 | 91-35-660 | 1 |
| Q13 | Transistor Special | 94-53-099 | 1 |
| Q14 | Transistor Special | 94-53-107 | 1 |
| | Potentiometer: | | |
| R113 | Potentiometer 2K | 88-15-271 | 1 |
| | Resistor: | | |
| R86, R104 | Metal film 50K $\frac{1}{2}$W 1% | 85-11-725 | 2 |
| R87, R90 | Comp. 150K $\frac{1}{2}$W 5% | 86-05-580 | 2 |
| R88 | Comp. 68K $\frac{1}{2}$W 5% | 86-05-548 | 1 |
| R89 | Comp. 2.2K $\frac{1}{2}$W 5% | 86-05-396 | 1 |
| R91 | Comp. 15K $\frac{1}{2}$W 5% | 86-05-480 | 1 |
| R92 | Comp. 1.8K $\frac{1}{2}$W 5% | 86-05-388 | 1 |
| R93 | Comp. 100 ohm $\frac{1}{2}$W 5% | 86-05-264 | 1 |
| R96 | Metal film 14.4K $\frac{1}{2}$W 1% | 85-11-606 | 1 |
| R97 | WW 19.5K .25% | 16-13-200 | 1 |
| R105 | Metal film 49.9K $\frac{1}{4}$W 1% | 83-24-660 | 1 |
| R109 | Comp. 680 ohm $\frac{1}{2}$W 5% | 86-05-348 | 1 |
| R110 | Comp. 22K $\frac{1}{2}$W 5% | 86-05-496 | 1 |

| Reference or Symbol Designator | Nomenclature | Stock No. | Qty. Per Ass'y. |
|---|---|---|---|
| | Switch Divider Calibration Assy | 301-361-80 | 1 |
| | Mounting Bracket | 301-309-30 | 1 |
| | Shield | 301-310-30 | 1 |
| | Grommet | 90-28-024 | 2 |
| | Spacer 6-32 x 3/4 | 74-73-103 | 3 |
| | Spacer 6-32 x 7/8 | 74-73-118 | 6 |
| | Bracket, Angle | 74-08-121 | 1 |
| | Switch Shield | 95-80-602 | 2 |
| | Fiber Spacer | 74-73-050 | 20 |
| | Capacitor: | | |
| No. ref. desig. | Ceramic .02μf 1000V | 48-10-205 | 1 |
| No. ref. desig. | Ceramic .02μf 1400V | 48-15-205 | 1 |
| S1 | Switch, Index | 95-80-051 | 1 |
| S2G, H, J, K | Switch, Wafer | 94-80-288 | 4 |
| | AC High Voltage Board Assy | 301-104-81 | 1 |
| | Capacitor Mounting Bracket | 301-311-30 | 2 |
| | Capacitor: | | |
| C32 | Silver Mica 220μμf 500V | 53-21-221 | 1 |
| C34 | Silver Mica 39μμf 500V | 53-21-390 | 1 |
| C35, C36 | Cap. Variable .8-4.5μμf | 65-00-006 | 2 |
| | Potentiometer: | | |
| R77 | Potentiometer 10K | 88-20-782 | 1 |
| R78 | Potentiometer 1K | 88-20-506 | 1 |
| | Resistor: | | |
| R68, R69, R70 | Metal film 1 meg $\frac{1}{2}$W 1% | 83-44-961 | 3 |
| R71 | Metal film 20K $\frac{1}{2}$W 1% | 83-44-646 | 1 |
| R72 | Metal film 121K $\frac{1}{2}$W 1% | 83-44-793 | 1 |

| Reference or Symbol Designator | Nomenclature | Stock No. | Qty. Per Ass'y. |
|---|---|---|---|
| | Gain Calibration Board Assembly | 301-105-80 | 1 |
| | Grommet | 90-28-024 | 1 |
| | Mounting Bracket, Capacitor | 301-311-30 | 2 |
| | Mounting Plate, Resistor | 95-80-603 | 2 |
| | Capacitors: | | |
| C24 | Met. Paper 1.0 mf 200V | 56-02-017 | 1 |
| C26, C43 | Cap. Var. .8-4.5pf | 65-80-006 | 2 |
| C41 | Silver Mica 33pf 500V | 53-21-330 | 1 |
| C44 | Silver Mica 39pf 500V | 53-21-390 | 1 |
| | Potentiometers: | | |
| R95 | Potentiometer 2K | 88-15-271 | 1 |
| R99 | Potentiometer 10 ohm | 88-15-065 | 1 |
| | Resistors: | | |
| R85 | Metal Film 1 meg $\frac{1}{2}$W 1% | 83-44-961 | 1 |
| R94, R111 | WW 100K $\frac{1}{4}$W .25% | 15-12-600 | 2 |
| R98 | WW 1.1K .25% | 16-13-120 | 1 |
| R106 | WW 108 ohm .25% | 16-13-053 | 1 |

| Reference or Symbol Designator | Nomenclature | Stock No. | Qty. Per Ass'y. |
|---|---|---|---|
| | Power Supply Board Assy | 301-103-82 | 1 |
| | Heatsink | 74-12-116 | 1 |
| | Capacitor: | | |
| C19A, C19B, C19C | Electrolytic 150-50-50μf 150V | 61-66-606 | 1 |
| C20 | Ceramic 100μμf 1000V | 48-10-101 | 1 |
| C21, C48 | Met. Paper 1.0μμf 200V | 56-02-017 | 2 |
| C22 | Electrolytic 500μf 50V | 61-50-508 | 1 |
| C23 | Tantalum 250μf 10V | 64-13-257 | 1 |
| | Diode: | | |
| D14, D20 thru D23 | Diode Special | 94-02-600 | 5 |
| D16 | 1N3043B | 92-30-435 | 1 |
| D17, D18, D19, D24 | Diode, Zener | 94-16-055 | 4 |
| | Transistor: | | |
| Q8 | Transistor Special (507) | 94-58-507 | 1 |
| Q9, Q10, Q11 | Transistor Special | 94-53-099 | 3 |
| | Resistor: | | |
| R79 | Comp. 2.2K $\frac{1}{2}$W 5% | 86-05-396 | 1 |
| R80 | WW 30K $\frac{1}{4}$W 1% | 12-11-790 | 1 |
| R81 | WW 12K $\frac{1}{4}$W 1% | 12-11-723 | 1 |
| R82 | Comp. 22K $\frac{1}{2}$W 5% | 86-05-496 | 1 |
| R83 | Comp. 10 ohm $\frac{1}{2}$W 5% | 86-05-164 | 1 |
| R100 | Comp. 33 ohm $\frac{1}{2}$W 5% | 86-05-216 | 1 |
| R101, R102 | Comp. 470 ohm 1W 5% | 86-06-332 | 2 |
| R103 | Comp. 4.7K $\frac{1}{2}$W 5% | 86-05-432 | 1 |
| R115 | Comp. 220 ohm $\frac{1}{2}$W 5% | 86-05-296 | 1 |
| | NOTE: C32, C34, C41, C44 R9, R22, R37, R63, R97, R107, R108 Values selected in test. | | |

## SECTION VI

## WARRANTY

The PRECISION STANDARDS CORPORATION warrants each instrument to be free from defects in material and workmanship. The instrument must be returned to the factory with shipping prepaid and a complete report of the difficulty. This warranty is good for one year from the shipping date.

## SHIPPING DAMAGE

If there is any damage to the instrument upon receipt, report this to the transportation claim agent immediately.

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